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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/617,892

07/11/2003

Ralph H. Johnson

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04/17/2006

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EXAMINER

MENEFEE, JAMES A

ART UNIT

PAPER NUMBER

2828

DATE MAILED: 04/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/617,892	Applicant(s) JOHNSON ET AL	
	Examiner James A. Menefee	Art Unit 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 January 2006.
 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 32-65, 67, 68 and 70-80 is/are pending in the application.
 4a) Of the above claim(s) 31-65 is/are withdrawn from consideration.
 5) ☐ Claim(s) _____ is/are allowed.
 6) ☒ Claim(s) 67, 68 and 70-80 is/are rejected.
 7) ☐ Claim(s) _____ is/are objected to.
 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

By amendment filed 1/23/2006, claims 66 and 69 are cancelled, the abstract and claims 67-68 and 70 are amended, and claims 72-80 are added. Claims 32-65, 67-68, and 70-80 are pending.

Election/Restrictions

Claims 32-65 remain withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 7/8/2005.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 75 recites the limitation “the second upper contact” in line 4. There is insufficient antecedent basis for this limitation in the claim. It is believed the term “second” should be deleted, as a “second” upper contact has not previously been recited.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 67-68, 73-74, 76, 78 are rejected under 35 U.S.C. 102(b) as being anticipated by Ackley et al. (US 5,317,587).

Regarding claim 67, Ackley discloses an optoelectronic device comprising first mirror 32, second mirror 38, active region 35 situated between the mirrors, a substantially equipotential layer 46, and an insulation layer 44 defining an aperture that encircles an optical cavity and situated between the second mirror and the equipotential layer. See Fig. 2 and discussion. The ITO electrode 46 is necessarily substantially equipotential.

Regarding claim 68, since the equipotential layer is ITO and the mirror is semiconductor, the conductance relationship will be met.

Regarding claim 73, Ackley's laser operates in the lowest order mode without including higher order modes, therefore is substantially single mode. Col. 3 lines 53-68.

Regarding claim 74, Ackley discloses in Fig. 2 a single mode VCSEL comprising a substrate 30 having a lower and upper surface, a bottom contact 47 disposed on said lower surface, a lower mirror portion 32 disposed on the upper surface of the substrate, an active region 35 disposed on the lower mirror, an upper mirror 38 disposed on the active region, an equipotential layer 46 disposed on the upper mirror, an insulating layer 44 disposed between the upper mirror and the equipotential layer and adapted to form an aperture, and an upper contact disposed upon the equipotential layer outside the aperture perimeter (not shown but present to provide electrical current to the device. See col. 4 lines 16-17).

Regarding claim 76, the lower mirror 14 may be n-type. Col. 6 lines 40-41.

Regarding claim 78, applicant discloses that it is preferable to make the upper mirror p-type because an n-type mirror may be anisotropic. P. 11 lines 23-25. Ackley's upper mirror is p-type, therefore can be said to be isotropic.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 67-68, 72-74, and 76-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schneider et al. (US 5,557,627) in view of Choquette et al. (US 5,493,577).

Regarding claim 67, Schneider discloses in Fig. 1 an optoelectronic device comprising first mirror 14, second mirror 18, active region 32 between the mirrors. Schneider additionally discloses that the top of the upper mirror may be highly doped. Col. 11 lines 10-13. Applicant admits in the specification that an equipotential layer can be a highly doped semiconductor, p. 11 lines 20-21, therefore this highly doped part of Schneider's mirror can be considered an equipotential layer.

Schneider does not teach an insulating layer defining an aperture that is situated between the second mirror and the equipotential layer. Choquette teaches as in Fig. 3 that there may be an insulating layer 20 having such an aperture. It would have been obvious to one skilled in the art to include the insulating layer 20 because it provides for confinement that increases light generation efficiency, as taught by Choquette. Col. 10 lines 15-25. In Fig. 3 of Choquette, this

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layer is located above the bottom of the upper mirror and below the top of the upper mirror (where Schneider's equipotential layer is located) and thus may be said to be situated between these regions as claimed.

Regarding claim 68, based on the materials of the equipotential layer and the upper mirror, i.e. highly doped vs. lightly doped, the conductivities will fall within the range as claimed.

Regarding claim 72, as noted in the rejection of claim 67 above, the equipotential layer is part of the upper mirror, a DBR in Schneider.

Regarding claim 73, Schneider may lase in only a single mode. Col. 13 lines 56-60.

Regarding claim 74, the claim is substantially rejected the same as claim 67 above. Schneider additionally discloses substrate 12, bottom contact 22, and upper contact 20.

Regarding claim 76, Schneider's lower mirror is n-type. Col. 6 line 40.

Regarding claim 77, Schneider discloses a plurality of quantum wells for the active region. Col. 9 line 47.

Regarding claim 78, applicant discloses that it is preferable to make the upper mirror p-type because an n-type mirror may be anisotropic. P. 11 lines 23-25. Schneider's upper mirror is p-type, therefore can be said to be isotropic.

Claims 70-71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ackley in view of Hegblom et al. (Electronics Letters, vol. 34 no. 9, April 1998). Ackley discloses the limitations of the claims as shown above, but does not disclose that the insulating layer includes a tapered tip positioned at or near an electric field null. Hegblom teaches a similar VCSEL where

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the oxidized portion is tapered, therefore has a tapered tip, and is located at the standing wave null. It would have been obvious to one skilled in the art to have a tapered tip for the aperture so that it is more lens like and optical scattering loss is nearly eliminated, as taught by Hegblom. See par. bridging pages 895-896. It would have been obvious to one skilled in the art to locate the aperture at the null so that perturbation caused by the difference in reflection of this layer will be minimized, as taught by Hegblom. P. 896, col. 1, near bottom of page.

Claims 70-71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schneider and Choquette as applied to claim 67 above, and further in view of Hegblom. See the above rejection for the reasoning as to Hegblom.

Claim 75 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ackley in view of Cox (US 5,812,581). Ackley discloses the limitations of the claims as shown above, but does not disclose the isolation regions as claimed. Cox teaches that an isolation region 62 may be formed on either side of a VCSEL device (therefore there may be first and second isolation regions—one on each side) extending through to the lower mirror. See Fig. 6. It would have been obvious to one skilled in the art to include isolation regions so that the VCSEL may be isolated from neighboring devices, as taught by Cox. Col. 8 lines 2-5.

Claim 75 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schneider and Choquette as applied to claim 74 above, and further in view of Cox. See the above rejection for the reasoning as to Cox.

Claim 77 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ackley in view of Schneider et al. (US 5,557,627). Ackley discloses the limitations of the claims as shown above, but does not disclose the active region is a plurality of quantum wells. Schneider teaches that in a VCSEL the active region may be a plurality of quantum wells, and it would have been obvious to one skilled in the art to do this in order to increase the gain. Col. 9 lines 42-66 (discussing quantum well vs. bulk active regions, and preferring multiple quantum wells because of increased gain).

Claims 79-80 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ackley in view of Cox (US 6,185,241). Ackley discloses the limitations of the claims as shown above, but does not disclose first and second dielectric layers above the equipotential layer and aligned with the aperture. Sun teaches that in a VCSEL a dielectric mirror may be formed above the semiconductor upper DBR. Such a configuration yields first and second dielectric layers aligned with the aperture as claimed. It would have been obvious to one skilled in the art to use Sun's configuration as it provides for improved mode discrimination, as taught by Sun. See col. 1 lines 1-50.

Claims 79-80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schneider and Choquette as applied to claim 74 above, and further in view of Sun. See the above rejection for the reasoning as to Sun.

Response to Arguments

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection above. The new grounds are based solely on the amendment, i.e. the addition of the equipotential layer to the claims, thus this action may be made final.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Menefee whose telephone number is (571) 272-1944. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MinSun Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'J. Menefee', with a stylized flourish at the end.

James Menefee
April 11, 2006